

STUDIES IN THE COLD STORAGE OF AVOCADOS

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The need is becoming evident for precise information about the cold storage behavior of varieties of avocado produced commercially in Florida.

The work of previous investigators in the past several years has shown several peculiarities of different varieties of avocado in relation to cold temperatures. The peculiarities have been inconsistent among varieties in a race, as well as between varieties of different races. These traits or characteristics of the different varieties of avocados have very definite bearing upon the commercial application of cold storage practices.

Lyle¹ found that the Winslowson, a Guatemalan West Indian hybrid, was very sensitive to cold and at temperatures lower than 54° F. developed a very poor external appearance and a discoloration of the flesh, whereas Trapp, a West Indian variety, could be stored successfully for nineteen to twenty-one days at 48° F. And Taylor, a Guatemalan variety, could be stored successfully for fifty-four to fifty-six days at 42° F. Studies pertaining to the storage behavior of West Indian varieties in Trinidad² showed a striking range in the difference in, keeping quality and tolerance of low temperatures. Checking some of the more cold resistant West Indian varieties and also the Collinson, a Guatemalan x West Indian hybrid, Wardlow³ found his previous contentions on the West Indian varieties confirmed and also found that the Collinson would store for twenty one days at 40° F. or twenty-five days at 45° F without cold injury. Overholser⁴ found indications that most varieties of avocados, with the exception of the Fuerte, kept best at about 40° F. Thus it is obvious that to store successfully Florida avocados, with the fifteen or twenty commercial varieties grown at the present time, it is necessary to have the reaction of each variety to cold temperatures. With this end in view work was started in the fall of 1938. This paper presents an outline of the data thus far completed.

PLAN OF EXPERIMENT

The varieties of avocado chosen for the storage trials normally matured during the months from August through January. They were, in the order of their season of maturity, Pollock, Trapp, Waldin, Collinson, Booth 8, Lula and Taylor. The fruit was obtained partly from the Sub-Tropical Experiment Station grove and partly through the courtesy of South Florida Growers, Parman Lehman Packing Company, Brooks, Inc., The Florida Avocado and Persian Lime Growers, and Mr. Sam Davis. The samples, consisting of first grade fruit packed in standard lugs, were expressed to the Experiment Station cold storage plant in Gainesville at two-week intervals.

The temperatures at which the fruit was stored were 37, 42, 48° F and room temperatures. On arrival, six fruit were removed from each lot and placed at room temperature. The remainder of the fruit was placed at the above storage temperature. Samples of fruit from each room were removed at intervals of seven days for a twenty eight-day period and placed at room temperature to soften.

For the cold storage of avocado fruits to be considered successful, the flesh of the fruits should remain firm in storage for the desired period of two to four weeks with no pitting, discoloring or spotting of the skin, and no discoloration or off taste in the flesh. Furthermore, the fruit should not soften to an edible state after removal from storage for at least three days with no off-taste or discoloration of the pulp and no disfigurement of the skin.

The term "cold damage" as used in this paper refers to conditions manifest in the pulp. In some instances a graying or browning of the pulp appears either near the seed or in the tissue midway between the seed and the skin. In other instances the pulp becomes dark brown to black next to the seed, and in still other cases the vascular strands develop a brownish appearance making them stand out from the lighter colored pulp.

These conditions may appear singly or combined in a fruit.

RESULTS

POLLOCK:

The Pollock, a West Indian variety, was stored from three shipments made during August. At room temperature the fruit softened in five to six days, remaining marketable for another three days. Stored at 37°, cold damage became evident at fourteen days. At 48°, the fruit softened in storage after twenty-eight days, and on preceding dates softened too rapidly after removal from storage. The 42° storage temperature was optimum for the Pollock, as the fruit remained firm for twenty-one days and softened in marketable condition three to five days after removal from storage. It remained in a marketable condition at room temperature for three more days.

TRAPP :

The Trapp, a West Indian variety, was stored from five shipments made from August 16 to October 11. At room temperature the fruit softened in five to nine days, remaining marketable for another three to five days. Fruit from shipments made later in the season softened sooner but remained marketable over a longer period. The Trapp reacted best to all cold storage temperatures of any of the West Indian varieties tested. At 37° cold damage was evident in twenty-one days. At 48° the fruit was marketable after twenty-one days but the length of time in softening after removal from storage was considerably shortened. The optimum storage temperature for the Trapp was 42°. The fruit remained firm and marketable for "twenty-one days, softened in four to six days at room temperature and remained in a marketable condition for another two to five days.

WALDIN:

The Waldin, a West Indian variety, was stored from four shipments made from September 13 to October 25. At room temperature the fruit softened in four to seven days, and remained marketable for five days after softening. The Waldin was very susceptible to cold injury. At 37, 42 and 48°, cold injury to the pulp and a decided pitting and spotting of the skin was evident after seven days. None of the cold storage temperatures at which the Waldin was tested proved successful.

COLLINSON:

The Collinson, a Guatemalan x West Indian hybrid, was stored from four shipments made from October 10 to December 1. At room temperature the fruit softened in nine to thirteen days and remained in marketable condition from three to four days after softening. When stored at 37° cold damage became evident at the fourteen-day inspection. The fruit stored equally well at 42 and 48°, being firm upon removal from storage, softening in four to six days and remaining marketable for three to four days longer after softening. The marketability of Collinson is obviously not benefited materially by storage at cold temperatures. The fruit when held at room temperature permits twelve to fifteen days for marketing, whereas when stored at its optimum cold storage temperature of 42 to 48° it allows only twenty-one to twenty-four days, or a week longer, for marketing.

BOOTH 8:

The Booth 8, also a Guatemalan x West Indian hybrid, was stored from three shipments made from November 8 to December 7. At room temperature, the fruit softened to edible state in eight to eleven days and remained marketable after softening for another three days. Stored at 37° some cold damage became evident after seven days. Discoloration of the flesh also was evident in some of the fruit stored at 48° after seven days, with more discoloration appearing after fourteen days. The optimum storage temperature for the Booth 8 was 42°. The fruit held at this temperature was firm after fourteen days, required five to seven days to soften at room temperature and remained marketable for one to four days after softening. Booth 8 apparently is not particularly adapted to cold storage, for by storage at 42° there was a gain in the marketable life of the fruit but seven to nine days over fruit kept at room temperature.

LULA:

The Lula, a Guatemalan x Mexican hybrid, was stored from shipments made from November 22 to January 4. At room temperature, the fruit softened to an edible state in six to fourteen days and remained marketable for three days after softening. The Lula reacted well at all storage temperatures. At 37° the fruit was firm after twenty-eight days in storage. It required three to six days to soften after removal from storage, showed no cold damage, had good flavor, and was marketable for two to three days after softening.

Stored at 42°, the Lula remained firm with no cold damage for twenty-eight days but the skin showed spotting after the twenty-first day. Stored at 48° the fruit softened in storage after twenty-one days.

TAYLOR:

The Taylor, a Guatemalan variety, was stored from three shipments made from December 22 to January 17. At room temperature, the fruit softened in six to seven days and remained in a marketable condition for four days more after softening. At 48° some of the fruit softened in storage after fourteen days. The Taylors stored at both 37 and 42° remained firm for twenty eight days and softened to a marketable condition. The optimum cold temperature for the Taylor was 37°. At this temperature the fruits did not show as many skin blemishes after twenty-eight days as those stored at 42°, and the fruit softened to an edible state in four to six days, remaining in a marketable condition for two or three days after softening.

SUMMARY

Cold storage studies on avocado varieties during the 1938-39 seasons indicated that different varieties require different optimum cold storage temperatures, and that some varieties are evidently not adapted to cold storage at the temperatures tested.

Pollock and Trapp were stored successfully at for twenty-eight days.

Booth 8 was stored successfully at 42° for fourteen days but this only preserved the fruit seven to nine days longer than storage at room temperature.

Waldin and Collinson did not react favorably to storage at temperatures of 37, 42 and 48°.

Lula and Taylor were stored successfully at 37° for twenty-one days.

LITERATURE CITED

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